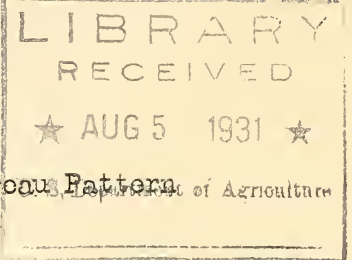


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U. S. Department of Agriculture  
Weather Bureau.



Instructions for the Operation and Use of Weather Bureau Pattern  
Hygrothermograph.

General description.— The distinguishing feature of the Weather Bureau pattern hygrothermograph is that both the thermometric and hygrometric elements are at the same end of the instrument, the record of temperature being made on the upper portion of the chart and of humidity on the lower portion. The charts graduations represent two degrees of temperature or two per cent of humidity. The instrument is rather large, base 6 inches by 12-1/4 inches, height 9 inches, with cover closed. The hinged cover requires a vertical clearance of 17-1/4 inches to permit it to be thrown back to give access to the interior.

The clock.— The recording cylinder is driven by an internal clock of good quality with full jeweled anchor escapement, capable of a week's record with one winding. The clock, cylinder, driving gears and spindle should always be kept together since such parts are not interchangeable one instrument with another. When cleaning and oiling becomes necessary a well qualified man should be engaged and he should be cautioned to use sparingly high grade clock or watch oil with a low cold test. If the clock stops at low temperatures it should be carried indoors to be warmed up and thoroughly dried rather than indiscriminately rushed to a jeweller. The stoppage may be occasioned by frozen moisture in the bearings.

The temperature element.— The well known Bourdon tube type in which one end is free to move in response to change in volume of a non freezing liquid with which it is filled is employed. Adjustment of the pen on the sheet is accomplished by turning a large milled nut projecting to the right of the tall vertical member of the casting. A secondary adjustment for range within the case proper is set correct when the instrument is calibrated and should not thereafter be changed.

The humidity element.— Adjustment of the humidity pen to the desired scale value is made by turning a large milled nut just back of the hairs. An adjustment for range directly above the top suspension of the hair element should not be disturbed unless upon the installation of a new hair element the range is found to have been materially changed. Replacement hair elements are supplied with the hairs assembled in the clamping terminals. To install a new set, remove and replace the small pins with tweezers, or small pliers. Because of the tedious processes required in their construction the hair elements are expensive. They should be renewed only when really impaired.

Exposure.— When used in a cotton region shelter the hygrothermograph may be set on the floor of the shelter at the back. In this position there is room to raise the cover within the space back of the cross board that supports the thermometers. However in this position the hygrothermograph may be slightly affected by radiation due to direct sunshine on the louvres of the shelter, particularly on bright still days, and hence it is preferable but not imperative to place the instrument shelter

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itself where it will be somewhat shaded during the middle of the day. When used in the large standard instrument shelter an inexpensive board support may be employed to mount the hygrothermograph just inside the shelter door.

Pen pressure.-- In order to insure the light contact with the paper essential to best results the pen arms are pivoted on an axis inclined to the vertical. The pen is thus held against the sheet by gravity, assuring the correct pressure.

To set the clock.-- The clock may be set for time by rotating it in either direction. However, the final setting should be made by slightly drawing the clock to correct time in a direction opposite to that in which it runs in order to take up backlash.

To set the pens.-- The temperature pen should be set to agree with a standard thermometer, preferably on a day when the wind is blowing to assure uniformity in temperature of both. To set the humidity pen wet the hairs thoroughly by stroking them with a clean camel's hair brush for about 10 minutes. The pen should then be set at 95 per cent on the sheet. No simple test for the zero end of the scale is known and reliance must be placed upon the original calibration of the hairs.

Performance.-- Exact agreement with determinations by dry and wet bulb psychrometer is not to be expected mainly because of uncertainties in the performance of the hair elements, but also because of imperfections in the psychrometric method due to many causes. However application of the corrections to the trace over a period of several weeks will serve to determine an average value by which the pen may be raised or lowered. It must also be recognized that the hairs sometimes change their zero for reasons not fully understood. Such change is likely to occur following a period of extremely low humidity. All these uncertainties are recognized in the design of the record sheet which makes no provision for the refinement possible in temperature determinations. An occasional difference of 10 per cent is not unusual, particularly when the humidity is changing rapidly.

Record charts.-- Forms 1074B, humidity 0 to 100, temperature scale 10 to 110; and Forms 1074-C, humidity 0 to 100, temperature scale 20 to 80 are stocked in the Central Office of the Weather Bureau. These two forms differ only in the numbers printed on the temperature scale.

Ink.-- Only the special register ink supplied by the Weather Bureau should be used. The bottle should be kept stoppered to prevent drying out.

Pens.-- The special pens, known as barograph pens, are the same as used on Weather Bureau barographs and thermographs.

Care of hair element.-- The hairs have been originally washed with ether to remove the natural oil, which would otherwise nullify their hygroscopic properties. In order to preserve this condition the hairs should not be touched with the fingers, which contain natural oil. They should be washed occasionally with distilled water applied with a camel's hair brush.

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Where the air is polluted, successful operation is doubtful, and plans for installation under such conditions should not be undertaken without preliminary correspondence.

B. C. Kadel,  
Chief, of Instrument Division.

Washington, D. C.  
July 16, 1931.



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